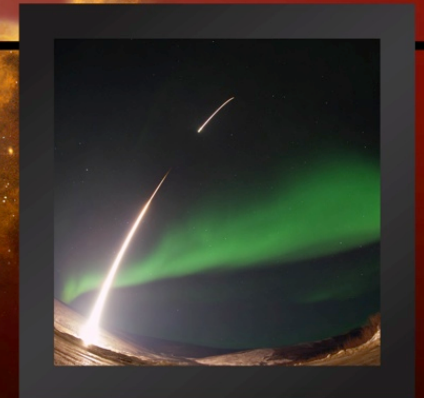
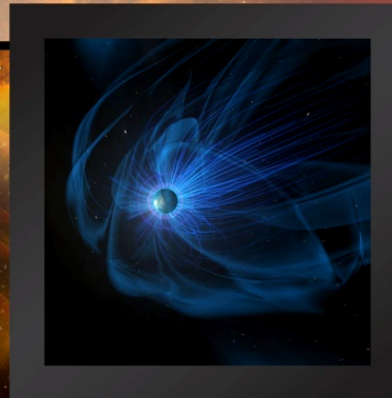
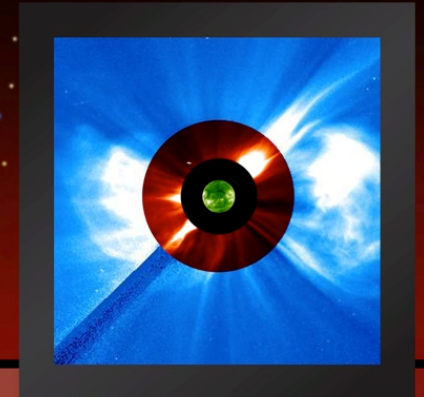
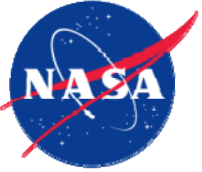




HELIOPHYSICS DIVISION



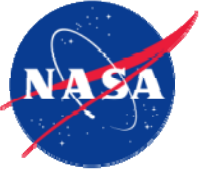
*Heliophysics Division Overview
Heliophysics Subcommittee Meeting
September 29-30, 2015
Steven W. Clarke, Director*



Overview Topics



- **Welcome and Opening Remarks**
- **Science Highlights**
- **Budget Update**
- **National Space Weather Strategy**
- **International Collaboration Update**



Welcome and Opening Remarks



Science Highlights

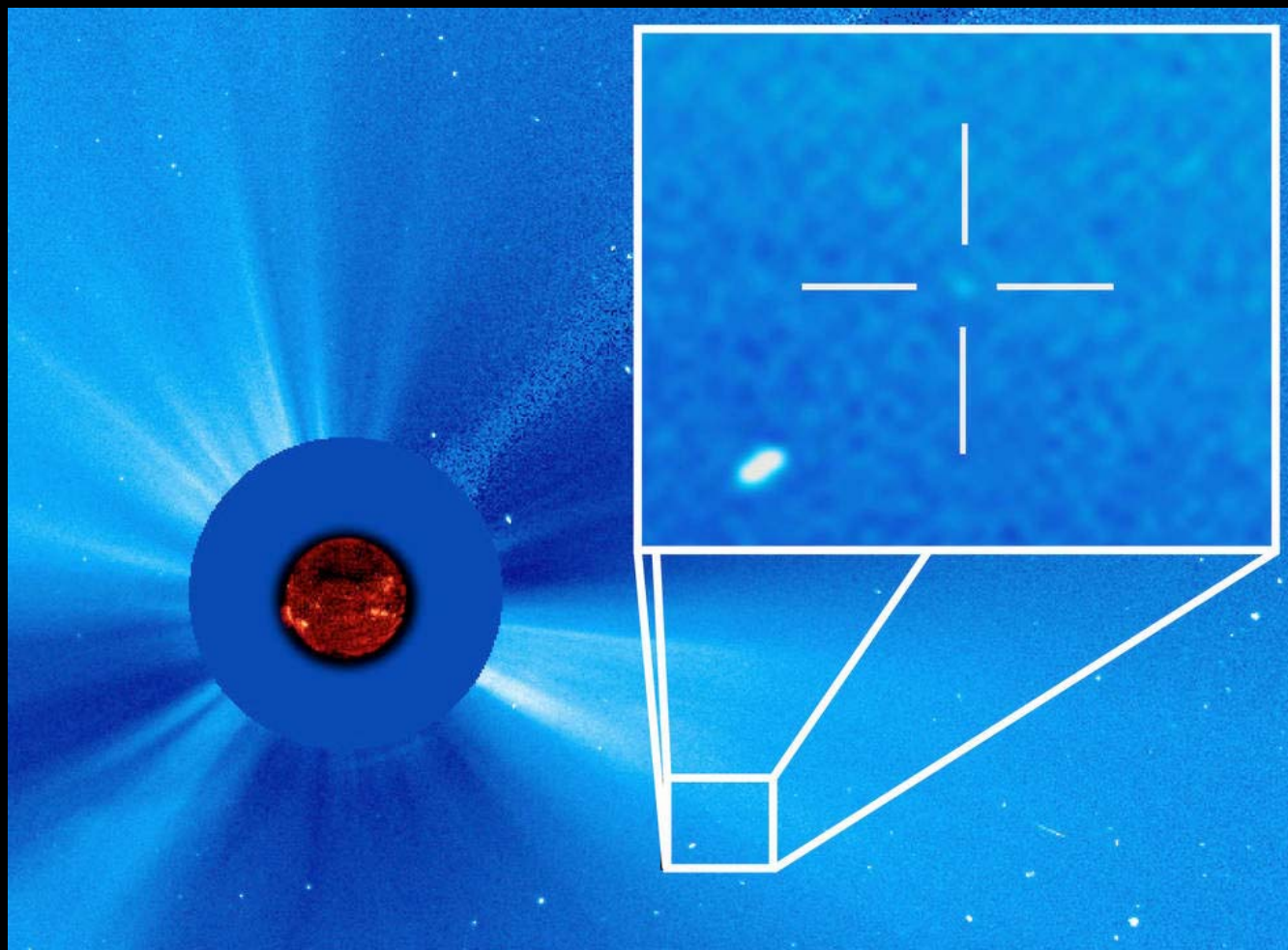


Heliophysics Science Highlights

September 2015



SOHO Discovers Its 3,000th Comet!



- On Sept. 13, 2015, citizen scientist Worachate Boonplod, of Samut Songkhram, Thailand used data from the Solar and Heliospheric Observatory (SOHO) to discover its 3,000th comet.

- Prior to the 1995 launch of SOHO, only a dozen or so comets had ever even been discovered from space, while some 900 had been discovered from the ground.

- SOHO's great success as a comet finder is dependent on the people who sift through its data – a task open to the world as the data is publicly available online in near-real time. The result: 95 percent of SOHO comets have been found by these citizen scientists.



Heliophysics Science Highlights

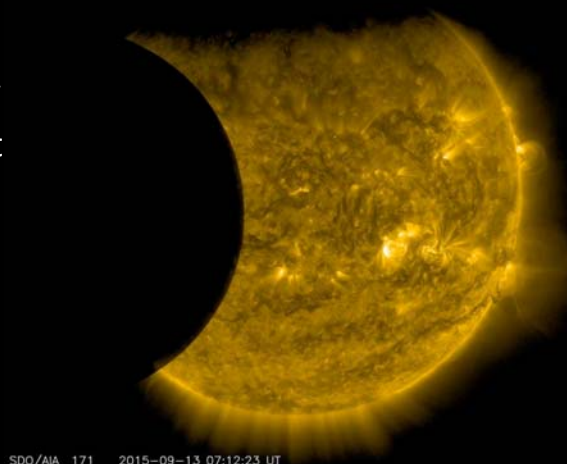
September 2015



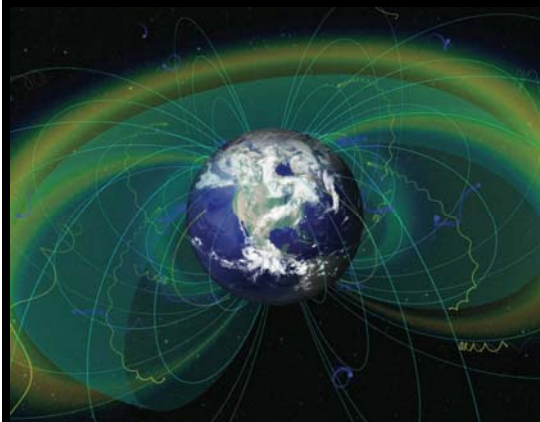
NASA's BARREL Team Return from Sweden: After seven balloon launches in the bright Arctic sun, the BARREL team has returned home from a 4-week campaign in Kiruna, Sweden, north of the Arctic Circle. Each research balloon observed emissions high in our atmosphere that correlated to events in the complex space environment above. This third mini-balloon campaign follows two 20-balloon campaigns that launched from Antarctica in 2013 and 2014. The team also achieved science conjunction with six other missions during this campaign, collecting data in coordination with NASA's Van Allen Probes, MMS, THEMIS, the joint ESA/NASA Cluster and two CubeSat missions.

SDO Observes an Earth Eclipse and a Lunar Transit in the Same Day

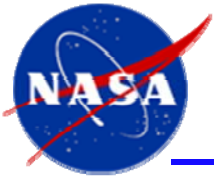
On Sept. 13, 2015, as NASA's Solar Dynamics Observatory, or SDO, kept up its constant watch on the sun, its view was photo-bombed not once, but twice. Just as the moon came into SDO's field of view on a path to cross the sun, Earth entered the picture, blocking SDO's view completely. When SDO's view of the sun emerged from Earth's shadow, the moon was just completing its journey across the sun's face.



SDO/AIA 171 2015-09-13 07:12:23 UT



Van Allen Probes Celebrate Third Anniversary of Launch: On Aug. 30, three years after NASA's Van Allen Probes were launched, the twin spacecraft continue to push the boundaries of what is known about the space above our world. These discoveries have led to the formulation of new objectives for the extended mission including optimized data compression and a new maneuver to double the number of times the spacecraft lap each other, allowing scientists to gather more detailed information on the processes that accelerate radiation belt particles.



Voyager in the News



Voyager on the cover of American Scientist

An article written by Drs. Stamatis Krimigis and Robert Decker entitled “The Voyager’s Odyssey” is the feature story in the July-August 2015 issue of American Scientist (volume 103, number 4). The article describes the challenges and discoveries Voyager has experienced on its journey to interstellar space.

<http://www.americanscientist.org/issues/id.115/past.aspx>





Budget Update

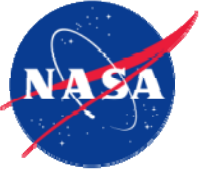


Budget Update



- Draft Continuing Resolution is currently undergoing negotiations by the House and the Senate
- CR is proposed to cover October 1 – December 11, 2015

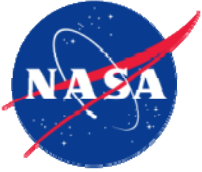
		12/10/14			9/22/15	
FY15 All Values (\$M)	Pres FY 15 Req (PBR)	Cromnibus Enacted Level	Delta from FY15 PBR	Pres FY 16 Req (PBR)	Draft CR Level	Delta from FY16 Req
Science	4,972.0	5,244.7	272.7	5288.6	5,233.6	-55.0
Aeronautics	551.1	651.0	99.9	571.4	649.6	78.2
Space Technology	705.5	596.0	-109.5	724.8	594.7	-130.1
Exploration	3,976.0	4,356.7	380.7	4505.9	4,347.5	-158.4
Space Ops	3,905.4	3,827.8	-77.6	4003.7	3,819.7	-184.0
Education	88.9	119.0	30.1	88.9	118.7	29.8
Safety, Security and Mission Services	2,778.6	2,758.9	-19.7	2843.1	2,753.1	-90.0
Construction & Environmental	446.1	419.1	-27.0	465.3	418.2	-47.1
Inspector General	37.0	37.0	0.0	37.4	36.9	-0.5
NASA Total	17,460.6	18,010.2	549.6	18529.1	17,972.2	-556.9
Science	4,972.0	5244.7	272.7	5288.6	5,233.6	-55.0
Earth Science	1,770.3	1772.5	2.2	1947.3	1,768.8	-178.5
Planetary Science	1,280.3	1437.8	157.5	1361.2	1,434.8	73.6
Astrophysics	607.3	684.8	77.5	709.1	683.4	-25.7
JWST	645.4	645.4	0.0	620.0	644.0	24.0
Heliophysics	668.9	662.2	-6.7	651.0	660.8	9.8
Education*		42.0	42.0		41.9	41.9



Heliophysics Budget Strategy



- Use the scientific priorities of the 2013 Decadal Survey to guide strategy and inform decisions.
- Ensure funding for missions in development
- Ensure funding for currently operating missions per 2015 Senior Review
- Maintain and grow competed PI research award program at no less than current funding level (~\$63M/year => ~\$100M/year)
- Ensure funding for missions entering extended operations (SDO, VAP, IRIS)
- Maintain and grow mission wedge for future missions, after launch of SOC and SPP
- Ensure balanced portfolio to meet Heliophysics science objectives: Research, LWS, STP, Explorers
- Maintain viable sounding rocket/range program for the benefit of the Agency
- Infuse technology and innovation for the benefit of future Heliophysics missions



Budget Alignment With 2013 Decadal Survey

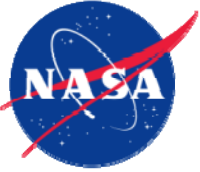


The NASA FY15 Appropriation and the FY16 President's Budget Request, including the notional out-year budget estimates, support the following:

0.0 Complete the current program	Extended operations of current operating missions as recommended by the 2015 Senior Review; 5 missions currently in development (SET, ICON, GOLD, SOC and SPP)
1.0 Implement DRIVE (Diversify, Realize, Integrate, Venture, Educate)	Implementing DRIVE initiative wedge in FY15; fully funded in FY18
2.0 Accelerate and expand Heliophysics Explorer program	Release of next Explorer mission AO planned for 2016 (~3.5-year average historical cadence) vs. Decadal recommendation of every 2-3 years; strategy to increase cadence under assessment; notional mission cadence increases to Decadal recommendation by the early-2020s.
3.0 Restructure STP as a moderate scale, PI-led flight program	Assessing trade space for STP-5; next STP mission AO planned for 2017 with a LRD ~2023
4.0 Implement a large LWS mission and launch by 2024	Release of next LWS mission AO NET 2018 as recommended by Decadal Survey



National Space Weather Strategy



National Space Weather Strategy



- The Office of Science Technology Policy (OSTP), Executive Office of the President, is leading the multi-agency effort to develop a National Space Weather Strategy (NSWS).
- The NSWS will articulate strategic goals for improving forecasting, impact evaluation, and enhancing National Preparedness (protection, mitigation, response and recovery) to a severe space weather event.
- A Space Weather Action Plan (SWAP) is being developed to establish cross-Agency actions, timelines and milestones for the implementation of the NSWS.
- The Action Plan will:
 - Enhance the transition of research to operations for space weather observations, modeling tools, advance warning capabilities and mitigation approaches
 - Incorporate severe space weather events in Federal emergency preparedness, planning, scenarios, training, and exercises
 - Establish Federal and non-Federal stakeholder collaborations to enhance observing systems and networks and data management activities



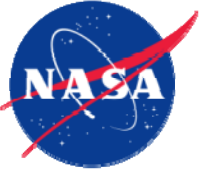
International Collaboration Update



International Collaboration Update



- European Space Agency (ESA)
 - Bilateral meetings between Science Mission Directorate leadership and ESA leadership September 22-23 at the European Space Research and Technology Centre (ESTEC), The Netherlands
 - Heliophysics-related topics included
 - Solar Orbiter Collaboration mission development progress
 - US participation in the Turbulent Heating Observer (THOR) mission as one of three down-selected proposals as part of the ESA M4 call; final selection will be in mid-2017.
 - US participation in the Solar wind Magnetosphere Ionosphere Link Explorer (SMILE) ESA-Chinese Academy of Sciences (CAS) partnership; final decision on mission adoption by both ESA and CAS is expected in November 2015
- Indian Space Research Organisation (ISRO)
 - Meeting between the Heliophysics Division and ISRO counterparts on August 14 at NASA HQ
 - Overview of ISRO and NASA Heliophysics activities presented
 - Proposed areas of collaboration have been provided to ISRO, including, but not limited to:
 - Modeling of solar activity
 - Joint observations and data analysis
 - Ground-based observations
 - Establishment of an ISRO-NASA Heliophysics Working Group under assessment

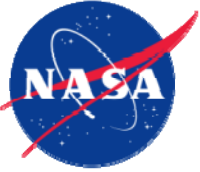


THOR



Turbulent Heating Observer (THOR)

- Sun-pointing slow-spinning spacecraft with a comprehensive payload that includes instruments for measuring electric and magnetic fields, electrons and ions
- Science addresses primarily NASA Heliosphysics Key Science Goal 4: “Discover and characterize fundamental processes that occur both within the heliosphere and throughout the universe.”
- U.S. science community interest in participating in the Phase A study
 - University of New Hampshire (UNH)
 - University of California, Berkley (UCB)
 - NASA Goddard Space Flight Center (GSFC)
- U.S. interest includes instrument development and science and analysis



SMILE



Solar wind Magnetosphere Ionosphere Link Explorer (SMILE)

- European Space Agency (ESA) partnership with the Chinese Academy of Science (CAS)
- 3-year, high-apogee mission that will encounter the key regions necessary to study how plasma turbulence dissipates energy and how ions are accelerated: the Earth's bow shock, including the shock transition region and the foreshock, the magnetosheath, the inner magnetosphere, as well as the pristine solar wind.
- U.S. interest in study phase based on the following timeline
 - Nov 2015 Decision to proceed by ESA and CAS
 - Dec 2015 Study phase begins
 - 2017 Implementation
 - 2021 Launch
- ESA and CAS are interested in U.S. participation